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BENEFIT-COST ANALYSIS OF SELECTED COUNTRY RESIDENTIAL SUBDIVISIONS IN MUNICIPAL DISTRICT OF STURGEON NO. 90

Research & Development Branch

Planning Services Division

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INTRODUCTION

Country residential development (C.R.D.) has occurred in rural and agricultural areas close to many of the large urban centres of Canada. Some rural municipalities have actively encouraged this type of development, but most provincial and regional planning agencies have attempted to encourage regulation of country residential and some have actively discouraged such development. Various qualitative assessments of the social, political, economic and agricultural repercussions suggest that exurban settlement is detrimental to many facets of rural life. Not only may good agricultural land be lost but the group characteristics of C.R. families may contrast with those of farm families, resulting in social friction, and differences of opinion among rural councillors over the levels of service that the municipal government should provide.

Some attempts have been made to measure the benefits and costs of country residential development. Most concentrate on the loss of farmland and adopt a broad public viewpoint, and a few studies have attempted to measure the impacts from the viewpoint of the country residents themselves. Despite the existence of detailed municipal financial records, few attempts have been made to evaluate the direct economic impact of country residential acreages and subdivisions on local government. Consequently, controversy over the quantifiable costs and benefits of country residences has persisted in somewhat of an information vacuum.

PURPOSE

The purpose of this paper is to present the findings of a study designed to measure the long-term costs and benefits to a municipality of permitting the development of country residential subdivisions. Municipal authorities possess the planning authority to approve or reject proposed new developments, subject to regional guidelines and constraints and the provisions of the subdivision regulations. But in the absence of

definitive analysis, councillors and officials have to rely on conventional wisdom, intuition and past experience to guide decision-making on applications for country residential subdivisions. The viewpoint adopted is a municipal viewpoint. The report simply approaches the costs and benefits as either municipal benefits or liabilities. School board costs have not been covered. The broader provincial viewpoint would include such matters as commuting costs and the alternative values of the land, but these have all been excluded deliberately and may be treated in other, later, reports.

Ideally a province-wide study of the costs and benefits of country residential development might lead to generally applicable conclusions. Resources were not available to undertake such an ambitious project and therefore a case study approach was adopted. The municipality selected for study was the M.D. of Sturgeon #90, located immediately to the north of the city of Edmonton, Alberta. Twelve C.R. subdivisions established in the M.D. since 1969 were analyzed for their impact. No attempt is made to provide general conclusions on country residential development because the results are particular to Sturgeon and to the twelve selected subdivisions. No information is available on whether the Sturgeon experience is similar to other municipalities or subdivisions elsewhere in the Province. It is suspected from the work undertaken by Research & Development Branch that cases and conditions differ widely in various parts of the Province. This report establishes, however, that the methodology can be applied to yield meaningful results wherever data on particular subdivisions can be obtained. Research & Development Branch is very grateful for the high level of co-operation and tolerance shown by the officials of the M.D. of Sturgeon, but the contents of this report are the responsibility of Research & Development Branch including any errors or ommissions that may exist.

METHODOLOGY

The subdivisions were selected on the basis of "level of municipal services provided". Five received neither water nor sanitary sewer

service, four received water service but no sewer service and two received both water and sewer service (Table 1). The municipal revenues and expenditures related to each subdivision were computed from data in the M.D.'s Financial Statements, trial balances and office records. All internal transfers (to and from operating functions, operating reserves and capital accounts) were ignored in order to avoid double-counting A diagram of the municipal costs and revenues included is presented as Figure 1.

The annual data relating to the entire M.D. were classified on the basis of "geographical assignability". Separable revenues and costs, i.e. those which could be traced to specific locations (anywhere in the M.D., not just the subdivisions being studied), were subtracted from the M.D.'s total operating revenues and expenditures. The non-separable remainders were then divided by the M.D.'s population and allocated among the subdivisions on the basis of population. These prorated quantities were subsequently added to the separable revenues and expenditures associated with the study subdivisions. The separable revenues consisted of municipal taxes, payments for water and sewer and developers' levies. The separable expenditures were actual costs and overhead costs incurred on roads, street lighting, water service, sewer service and the mowing of reserve land by the Agriculture Service Board. The overheads of the responsible M.D. departments were distributed among the subdivisions in proportion to population or number of customers. Major assumptions are included as Appendix 1 and complete details of the classification system are given in Appendix 2.

The total revenues and expenditures assignable to each subdivision were calculated for each year between the signing of the development agreement and 1983, inclusive. In order to facilitate benefit-cost analysis, each series of data was then extended to span a 25-year period.

Actual annual revenues and costs were adjusted by the Consumer Price Index to give inflation free (or constant) dollars based on the first year of the series, i.e. whenever the subdivision was created. The constant dollar values cannot therefore be cross-compared since the base

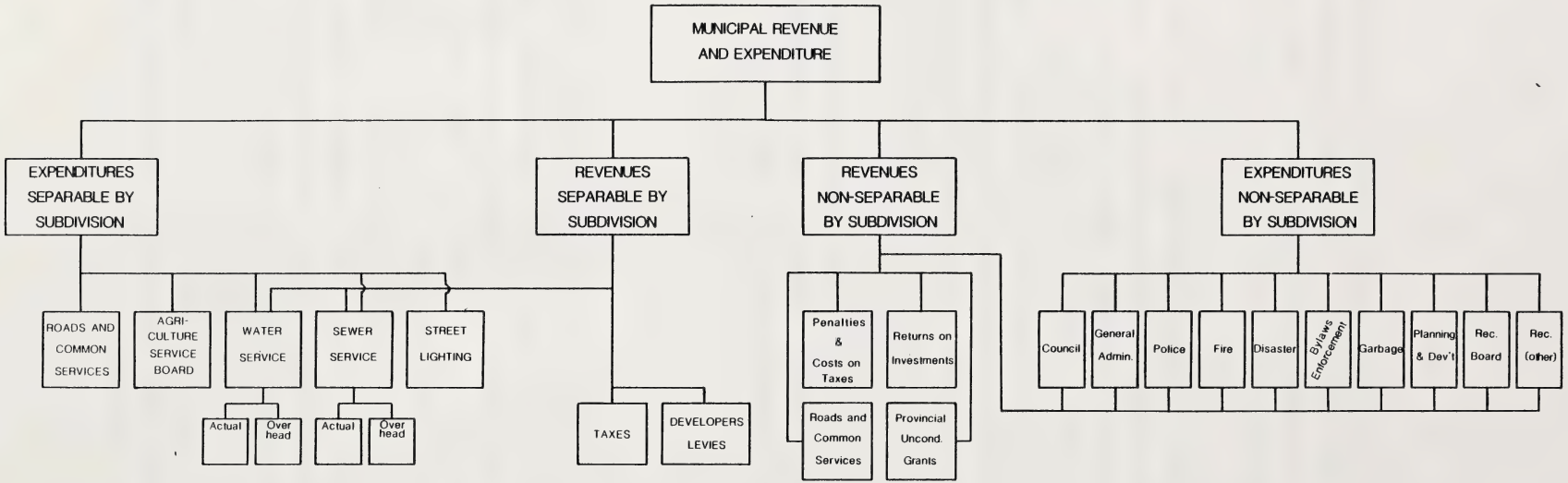

Figure 1

Municipal Revenues and Expenditure Sources

years are different. However the benefit cost ratios are a useful internal measure of performance along with the net benefits (or costs) for each subdivision. A time series of twenty-five years was constructed from actual values or projected future values based on 1983 performance. The time series, it could be argued, should be extended to give a realistic lifetime for each subdivision and its residences--forty years could probably be defended--but it was felt that twenty-five years provided a minimum measure of lifetime and was conservative. A real rate of return of 5% was assumed in order to calculate a present worth of benefits and costs to year 1. It was felt that this rate fairly represented the inflation free expectation in public sector financing. Since cross comparisons were not intended between subdivisions, there was little need to use a range of discount factors for sensitivity testing.

RESULTS

Table 1 shows the key information about the subdivisions; it can be observed that the subdivisions show varying states of development and fall broadly into three categories, Group One (no water or sewer), Group Two (water but no sewer) and Group Three (water and sewer).

Table 2 shows the economic and financial information from which benefit/cost ratios are generated using firstly all identifiable costs and revenues, secondly subtracting certain special provincial grants, and thirdly adding the costs of selected municipal access roads to the cost side. It is important to recognize that while the benefit-cost ratios can be compared, the net benefits and benefit/cost streams cannot be cross-compared between subdivisions where the starting year is different, because all dollars are constant dollars discounted to year zero, whatever year that may be.

All the ratios are greater than 1:1, indicating that all the subdivisions examined are net assets to the municipality regardless of the basis for comparison. Moreover, most of the ratios lie between 2:1 and 3:1, showing that the positive net benefit of most subdivisions

Table 1

Description of Selected Country Residential Subdivisions in the M.D. of Sturgeon

Subdivision (with year of development agreement)	Pool. 1983	No. of lots with residences 1983	Percentage of lots occupied 1983	Levy paid by developer	Road mileage	Assessment 1983 a)All lots b)Occupied lots $	Average 1983 assessment of occupied lots $	Road surface: Gravel	Road surface: Gravel originally	Road surface: Paved	Water supply: Entire period	Water supply: Region during period	Sewer
Group One (no water or sewer)													
Clearview Acres (1976)	45	11	30	No	1.21	a) 772,190 b) 448,420	40,765	Yes	No	No	No	No	No
Lower Viscount Estates (1975)	94	26	96	No	0.48	a)2,307,890 b)2,281,370	87,745	No	Yes	No	No	No	No
Upper Viscount Estates (1970)	151	44	92	No	1.07	a)4,110,230 b)3,988,200	90,641	No	Yes	No	No	No	No
Gibbonslea (1977)	58	17	47	Yes	0.98	a)1,371,120 b)1,092,130	64,243	Yes	No	No	No	No	No
Braun Village (1977)	11	5	14	Yes	1.25	a) 547,410 b) 271,040	54,208	Yes	No	No	No	No	No
Group Two (water but no sewer)													
Namao Ridge (1974)	297	76	90	No	2.58	a)6,841,980 b)6,651,260	87,517	No	Yes	No	No*	Yes*	No
Hewitt Estates (1975)	191	58	88	Yes	2.63	a)4,252,090 b)4,118,540	71,009	No	Yes	No	Yes	No	No
Upper & Lower Manor Estates (1976)	328	107	74	Yes	2.90	a)14,700,370 b)13,380,230	125,049	No	Yes	No	No	Yes	No
Casa Vista (1978)	53	14	24	Yes	1.24	a)2,578,060 b)1,227,970	87,712	Yes	No	No	No	Yes	No
Group Three (water and sewer)													
Cardiff Echoes (1976)	318	113	45	Yes	2.70	a)9,832,870 b)7,360,220	65,135	No	No	Yes	Yes	No	Yes
Manor Estates Phase II (1981)	5	2	3	Yes	0.70	a)1,988,010 b) 161,730	80,865	No	No	Yes	Yes	No	Yes

Notes. *The municipality assumed the ownership and operation of a former co-op system during the period after the initial development of the subdivision.

Table 2

Benefit-Cost Comparisons for Selected Country Residential Subdivisions in the M.D. of Sturgeon

Subdivision (with year of development agreement)	(a) Summed stream of revenues (present value) $	(b) Summed stream of expenditures (present value) $	(c) Net benefit [(a)-(b)] $	(d) Benefit-cost ratio [(a):(b)]	(e) Summed stream of revenues (present value) excl. extraordinary provincial grants $	(f) Summed stream of expenditures (present value) excl. extraordinary provincial grants $	(g) Net benefit [(e)-(f)] $	(h) Benefit-cost ratio [(e):(f)]	(i) Summed stream of expenditures (present value) including costs of selected municipal access roads ($)	(j) Net benefit [(e)-(i)] $	(k) Benefit-cost ratio [(e):(i)]
Group One (no water or sewer)											
Clearview Acres (1976)	149,208	70,887	78,321	2.10:1	112,478	59,163	53,315	1.90:1	(no access road costs assigned)		
Lower Viscount Estates (1975)	307,913	125,521	182,392	2.45:1	247,908	107,032	140,876	2.32:1	218,459	29,449	1.13:1
Upper Viscount Estates (1970)	295,937	119,714	176,223	2.47:1	247,000	105,265	141,735	2.35:1	192,980	54,020	1.28:1
Gibbonslea (1977)	220,060	80,108	141,952	2.77:1	181,423	66,406	115,017	2.73:1	(no access road costs assigned)		
Braun Village (1977)	76,861	27,419	49,442	2.80:1	69,662	24,929	44,733	2.79:1	(no access road costs assigned)		
Group Two (water but no sewer)											
Namao Ridge (1974)	1,074,215	529,256	544,959	2.03:1	876,954	468,855	408,099	1.87:1	540,407	336,547	1.62:1
Hewitt Estates (1975)	612,051	287,815	324,236	2.13:1	517,581	255,448	262,133	2.03:1	(no access road costs assigned)		
Upper & Lower Manor Estates (1976)	1,488,301	691,907	796,393	2.15:1	1,311,515	629,743	681,772	2.08:1	1,048,916	262,599	1.25:1
Casa Vista (1978)	339,343	117,197	222,146	2.90:1	309,342	105,548	203,794	2.93:1	(no access road costs assigned)		
Group Three (water and sewer)											
Cardiff Echoes (1976)	1,447,331	927,377	519,954	1.56:1	1,262,887	999,282	263,605	1.26:1	1,151,575	111,312	1.10:1
Manor Estates Phase II (1981)	200,653	95,152	105,501	2.11:1	196,235	93,425	102,810	2.10:1	(no access road costs assigned)		

Notes. All calculations included anticipated future costs of road resurfacing within the subdivisions incurred at regular intervals (new gravel every 4th year, new oil every 7th year and new hard top every 10th year).

Money values are expressed in constant dollars. Present values refer to dollars discounted to the year of the first development agreement for the subdivision.

"Extraordinary provincial grants" consists of payments from:
i) Edmonton annexation grant (1982-86)
ii) Municipal debt reduction program (1979)

making a significant contribution to municipal revenues. The ratios for the subdivisions without water or sewer service generally exceed those of the subdivisions provided with one or both of these services. However, there is as much variation within the groups of subdivisions as between them: other factors are clearly at work.

In order to explain the variation in benefit, the circumstances and ratios of each subdivision are now analyzed in detail.

1) Group One subdivisions (no water or sewer service)

1.1 Clearview Acres

Established near the northern boundary of the M.D. in 1976, Clearview Acres has failed to attract many residents; in 1983, the subdivision was only 30 per cent occupied. As the average assessment of improved properties has also been relatively low, tax revenue from built-on lots has been limited. In addition, the size of the summed stream of revenues has been constrained by the absence of a developer's levy. However, all vacant lots generate tax revenue without creating a demand for services. The latter revenue has been sufficiently large to give the subdivision a quite substantial benefit-cost ratio of 2.10:1.

1.2 Lower Viscount Estates

Located to the north-east of St. Albert, this subdivision has succeeded in attracting residents to the point that 96 per cent of lots were occupied in 1983. A medium level of assessment has produced substantial tax revenue but, as in Clearview Acres, no development levy was collected. On the expenditure side, the larger population--both in relative and absolute terms--has resulted in a higher demand for services. Furthermore, a relatively large expenditure was incurred in upgrading the gravel road to an oiled road in 1978. Consequently, the net revenue from the subdivision is less than might be expected although the benefit-cost ratio of 2.45:1 exceeds that of Clearview Acres.

1.3 Upper Viscount Estates

This subdivision was established (in 1970) at least 5 years before any of the others examined in this report. It is similar in occupancy rate and average assessment to Lower Viscount Estates, to which it is adjacent. The discussion in 1.2 applies equally well to Upper Viscount Estates, whose benefit-cost ratio of 2.47:1 is almost identical to that of its neighbour.

1.4 Gibbonslea

The benefit-cost ratio for Gibbonslea--2.77:1--is greater than that of the previously discussed subdivisions but is not the result of a high level of occupancy or assessment. The critical factors are the collection of a developer's levy, the persistence of relatively high rate of lot vacancies and the absence of a road upgrading cost. As discussed in 1.1, taxes levied on vacant land inflate net revenue and the size of the benefit-cost ratio. When a developers' levy also enters the stream of revenues, this inflation is compounded.

1.5 Braun Village

Braun Village is similar to Clearview Acres, its neighbour, in being characterized by a low rate of occupancy and a low level of assessment. A developer's levy has been collected in respect of Braun, however. As with Gibbonslea, the additional revenue compounds the financial advantage of a high proportion of vacant lots, yielding a benefit-cost ratio of 2.80:1, the highest value in this group of subdivisions.

2) Group Two subdivisions (water but no sewer service)

2.1 Casa Vista

Casa Vista has a larger population than Clearview Acres, a similar road length and surface and double the average assessment per occupied lot. Its benefit-cost ratio is the largest of all the subdivisions examined, at 2.90:1. Water is supplied from a line built by the North East Water Board to link Gibbons to the Board's main line. The financing of the line was undertaken by the Board's member municipalities, each of which issued a debenture; the Board subsequently reimburses each member fully for every principal and interest payment. The benefit-cost ratio looks very different depending on how the costs of water supply through this line are apportioned. If the North East Water Board costs are treated as sunk costs from the viewpoint of Casa Vista, the subdivision shows the 2.90:1 cost-benefit ratio. However, if assignment is made to Casa Vista the ratio is reduced to 1.27:1 because the costs and revenues of water supply outweigh the other costs and benefits combined.

This particular allocation problem illustrates how important it is for a municipality to ensure a secure water supply source prior to subdivision approval and make adequate provision up front in the development agreement to cover such costs.

2.2 Namao Ridge

Namao Ridge and Casa Vista share the same average assessment on occupied lots but differ in many other characteristics. Namao Ridge is almost fully occupied, did not contribute a developer's levy and has had its road upgraded from a gravel surface to an oiled surface. Furthermore, annual Agriculture Service Board expenditures (on mowing) run well above $1000 while those in Casa Vista and the Group One subdivisions fall considerably short of this amount. The results of the high demand for services and the costs of roadway oiling are higher expenditure levels at Namao Ridge and a benefit-cost ratio of 2.13:1.

This ratio is smaller than for most Group One subdivisions, but still indicates a respectable net benefit.

2.3 Hewitt Estates

Hewitt Estates is similar to Namao Ridge in most key characteristics. Although a levy was collected from the developer of Hewitt Estates, the beneficial effect of this contribution to the stream of revenues has been offset by a lower average assessment than for Namao Ridge. The two subdivisions have similar benefit-cost ratio when calculated without reference to future road resurfacing, but when the latter costs are included, the ratio for Hewitt Estates is slightly greater than for Namao Ridge.

2.4 Upper and Lower Manor Estates

Upper Manor Estates is separated spatially from Lower Manor Estates but, for reasons of data availability, the two subdivisions must be treated as one. Since both were established in the same year and have received the same quality of servicing, this treatment is unlikely to affect the validity of any conclusions.

The average assessed value of occupied lots is the highest of any of the subdivisions examined. Moreover, developer's levies were collected and the lots are still a quarter unoccupied. Other things being equal, these conditions are conducive to a high net revenue. The benefit-cost ratio--2.15:1--is one of the higher in Group Two subdivisions but falls below the level of most Group One subdivisions. The principal reason this difference is the presence of street lighting in Manor Estates. The bills from Trans-Alta Utilities--which totalled $15,600 in 1983--are paid by the M.D. from the general tax revenue, not from a levy confined to Manor Estates residents. Lighting costs in the subdivision consequently exceed the "lighting revenues" traceable to the subdivision.

3) Group Three subdivisions (water and sewer service)

3.1 Cardiff Echoes

In Cardiff Echoes there is a medium average assessment and 55 per cent lot vacancy; developer's levies have been collected in the past. These characteristics might lead to expectations of a relatively high benefit-cost ratio for the subdivision but such is not the case. Both street-lighting and sewer service are provided, neither of which is paid for wholly, or even largely, by the residents of Cardiff Echoes. The relatively small benefit-cost ratio of 1.56:1 illustrates how sewer service deficits compound the ratio-depressing effects of street-lighting expenditure.

3.2 Manor Estates Phase II

This subdivision was only established in 1981 but has been singularly unsuccessful in attracting residents; in 1983, only 2 lots were built upon, representing a 3 per cent occupancy rate. Accordingly, service demand and expenditure are minimal. Since taxes continue to be collected from the 68 relatively highly assessed vacant lots, a reasonable net benefit results. It may be thought paradoxical that a largely uninhabited subdivision containing highly assessed land can benefit a municipality more than some occupied subdivisions, but this finding is tempered by the fact that a developer's failure to sell lots may be followed by bankruptcy--as in the case of the developer of Manor Estates Phase II--in which case the certainty and timing of the tax payments may be put in considerable doubt.

DISCUSSION

A number of factors combine to produce the benefit-cost ratio for a given subdivision. The average property assessment, vacant lots as a proportion of total lots and the presence or absence of a developer's levy, road upgrading, street-lighting, water service and sewer service are particularly significant.

When each element of cost and revenue are analysed certain items always yield a surplus or a financial loss. Water service produces a net surplus due to the municipality's policy of operating the system on a self-sustaining basis and recouping all costs through the charges imposed on customers. Sewer service, by contrast, is provided at a deficit. Since 1982, customers have been billed a nominal amount of $5/month but prior to that year there was no charge. As municipal policy is to cover the deficits out of the tax revenue from the entire municipality, sewer service in selected localities is a distinct disbenefit to the municipality as a whole and a factor which depresses the overall benefit-cost ratio for a subdivision. The same conclusion is true of street-lighting, the costs of which are met entirely from the general taxes of the municipality.

In view of the variety of possible explanations for a particular ratio, the differences in the average ratios for each of the three subdivision groups used in the analysis cannot be attributed to the provision or absence of water or sewer service alone. The average ratio for Group 1 is greater than that of Group 2 but the absence of water service in the former's subdivisions is only one contributory factor.

Another cautionary note should be sounded. The maintenance and resurfacing costs of the subdivisions' internal roads have been fully considered but not the costs associated with the adjacent municipal roads which link the subdivisions to "the outside world". Accurate data on the latter are unavailable, however, the Public Works Department of the M.D. has identified five roads which give access to the subdivisions and which have required substantial outlays on oiling in recent years. The roads (and linked subdivisions) are: Namao Ridge Road (Namao Ridge); Starkey Mine Road, 127th Street and Sturgeon Road (Viscount Estates and Manor Estates); and Cardiff Road (Cardiff Echoes).

The experimental addition of all the expenditures on these roads to the expenditures for the adjacent subdivisions resulted in much smaller benefit-cost ratios (Table 2). It is debatable whether or not it is realistic to assign 100 per cent of the costs to the subdivisions, however, the new ratios still suggest unequivocally that the municipality benefits from the presence of the subdivisions.

The calculation of future revenues assumes that, inter alia, provincial grants will continue to be received at the level and in the variety current in 1983. If the transfers were made less generous, the benefit-cost situation in the revenues would become considerably less rosy. Moreover, past and present ratios would be altered if the tax revenue attributed to a subdivision were reduced by an amount equal to the non-fiscal deficit in the subdivision: the deficit increases the municipal tax requirement and hence the taxes levied from the subdivision.

Additional calculations were made to examine the effects of provincial grants on the viability of country residential subdivisions from the municipal point of view. Many of the Province's transfer payments have population as part of the formula for determining the size of payment. The grants examined were, the Municipal Assistance Grant, the Senior Citizens Public Transportation Grant, the Disaster Services Grant, the Road Grant, the Engineering Assistance Grant and the major Cultural/Recreational Facility Grant.

The Municipal Assistance Grant and Road Grant are linked by formula to Equalized Assessment. As a result of the formuli it has been concluded, individual subdivisions appear to have possessed the potential of increasing these grants. However the impact appears to have been marginal. Access to actual grant calculation worksheets would be needed for judgements to be made with real certainty.

In 1983, the grants described above accounted for $1,221,096 or $89.25 per capita to the municipality as a whole. The effect of removing these per capita grants from the subdivision revenues based on 1983 figures was relatively small. The overall reduction of revenue might be in the order of 10% to 25% annually.

CONCLUSIONS

The key finding of this report is that of positive benefit-cost ratios for all the subdivisions. This finding is obviously very much dependent on the viewpoint adopted and the way the stream of benefits and costs are assigned.

The viewpoint adopted was a strictly municipal one. The agricultural land values foregone were excluded but might be included from the provincial or public viewpoint. No attempt was made to determine the impact of the subdivisions on school costs and benefits. Such matters as public health, social services and welfare were excluded because they are provincial concerns. Commuting costs to the individual owners were not considered. Other transportation costs for major road and highway movement were excluded. The results of the analysis of municipal costs and benefits seem to suggest that country residential subdivision looks beneficial for the municipality but may not be nearly as favourable from the point of view of either the individual property owner or the Province. Additional work should be done; firstly to determine whether other circumstances and locations are as favourable as those in Sturgeon; secondly to assess the costs and benefits from a provincial viewpoint.

Evidence from several other Provinces of Canada as well as Alberta shows that municipal councils favour country residential development, depending on the proposal placed before them and a variety of other considerations. Comments to subdivision approving authorities, and approvals, provide testimony to the fact that on many occasions rural Councils perceive such development as beneficial. It is the opinion of Research and Development Branch that the results of this study point up some reasons for these opinions. In practical terms, country residential development can be a plus in the municipal balance sheet.

APPENDIX I

MAJOR ASSUMPTIONS

1. The revenues and expenditures which were current for a subdivision in 1983 prevail at least until the end of the 25th year of existence of each subdivision, with the exception of:
   a) road resurfacing expenditures, which occur every fourth year in the case of gravel roads, every seventh year in the case of oiled roads and every tenth year in the case of paved roads;
   and b) payments on a debenture issued in connection with future sewer service to Manor Estates (Upper and Lower) and Viscount Estates (Upper and Lower), which are made only in 1983 through 1987.

2. Municipal revenues and expenditures which are geographically non-separable can be allocated among country residential subdivisions on the basis of population.

3. Snow-ploughing costs are $166/mile for paved and oiled roads; snow-ploughing and grading costs are $500/mile for gravel roads (1983 $).

4. The following variables remain constant for each subdivision from 1983 through the 25th year of existence:
   a) Total number of lots;
   b) Number of occupied lots;
   c) Total assessed value of properties;
   d) Population;
   e) Type of road surface;
   f) The range of municipal services provided;
   g) Level of consumption of water;
   h) Number of water and sewer service customers.

5. The following variables remain constant at the municipal level from 1983 through all future years:
   a) Municipal revenue;
   b) Municipal expenditure, except for years in which road resurfacing costs are incurred in the study subdivisions or payments are made on a sewer debenture (see Assumption 1 above);
   c) Mill rate and total assessed value;
   d) Snow-ploughing and grading costs;
   e) Prices of water and sewer service;
   f) Population;
   g) Farm: non-farm mix of the population;
   h) Municipal boundaries;
   i) Level and variety of provincial government grants received.

6. Road resurfacing costs post-1983 are $2000/mile for gravel roads (in 1983 dollars) and the 1983 dollar equivalent of the last actual expenditure (in 1983 or before) on oiling for oiled roads.

APPENDIX 2

Components and Sources of Municipal Revenues and Expenditures associated with Country Residential Subdivisions

1.1 Introduction

The municipal revenues and expenditures associated with individual subdivisions have been calculated from data contained in the M.D.'s annual Financial Statements, trial balances and ledger files as well as from data provided by M.D. staff.

The data in the Financial Statements refer to the municipality as a whole. The other sources permitted some of the municipal data to be disaggregated geographically (Figure 1). Those categories of revenue and expenditure which could be directly quantified at the subdivision level were described as "separable". Those which could not were described as "non-separable"; their values in each subdivision were estimated by distribution in proportion to population.

Each of the separable categories--roads, water service, sewer service, Agriculture Service Board and street-lighting--are composed of two sub-categories: (i) "actual" revenues and expenditures and (ii) overhead revenues and expenditures. The actuals are items which are recorded by subdivision in one or all years. The overheads are revenues and expenditures associated with the five functions which are not recorded by subdivision. They are allocated among the subdivisions as described below. To avoid double-counting, all internal transfers were deducted from separable and non-separable revenues and expenditures.

1.2 SEPARABLE Revenues and Expenditures

1.2.1 ROAD Expenditures

1.2.1.1 Actual expenditures in the subdivisions

The costs of several categories of work were obtained or estimated from sources in the Public Works Department, M.D. of Sturgeon.

Gravelling: simulated expenditures for relevant years were estimated by adjusting the actual 1983 cost of $2000/mile by the Consumer Price Index and multiplying the result by the road length.

The number of times that work had been performed in a particular subdivision was known but not the precise year(s). Gravelling by the municipality was, therefore, assumed to have occurred: EITHER (a) halfway through the period between development and 1983 or the upgrading of the road to an oiled surface, OR (b) at equal intervals through this period.

Future resurfacing was assumed to occur every four years.

Oiling: the actual expenditures in relevant years were available. Future resurfacing was assumed to occur every seventh year.

Paving: No repaving of subdivision roads has had to be performed by the municipality to date. Future repaving was assumed to occur every tenth year at a cost of $100,000/mile.

Snow-ploughing and grading: the expenditures in each year were estimated by adjusting the actual 1983 cost by the Consumer Price Index for each year and multiplying the result by the road length. The 1983 cost for gravel roads, which require both ploughing and grading, was $500/mile. Oiled and paved roads only require ploughing, which costs $166/mile.

1.2.1.2 Allocation of overhead expenditures among the subdivisions

No overhead expenditures were allocated among the subdivisions. The broadly categorized expenditures shown in the municipal financial statement could not be disaggregated into expenditures on specific projects and "overhead" expenditures. However, the largest sources of expenditure are a) salaries, b) contracted and general services and c) goods and supplies.

As the actual expenditures in the subdivisions obtained from the Public Works department are composed of labour, machine time and material costs, overheads were assumed to account for only a negligible portion of the published expenditures. Consequently, further efforts to estimate the size of any such overheads were abandoned.

SOURCE: M.D. of Sturgeon No. 90. Financial Statements, 1970 through 1983; Public Works Department staff, personal communications, summer 1984.

1.2.2. WATER Revenues and Expenditures

1.2.2.1 Revenues

1.2.2.1.1 Actual revenues from the subdivisions

Billed amounts, available for each subdivision from 1978 through 1983, were used as surrogates for actual payments by water customers. Consumption before 1978 was assumed to be zero although one--and possibly two--of the subdivisions may have received municipal water service in this earlier period.

1.2.2.1.2 Allocation of overhead revenues among the subdivisions

Internal records available for 1978 through 1983 permitted the identification of revenues not obtained from specific subdivisions or localities. These residual revenues consisted of such items as sales of water (general), sales of water meters, service charges and meter-reading penalties. They were apportioned among the subdivisions on the basis of each subdivision's share of the municipality's total revenue (as represented by billings) from identifable localities.

1.2.2.2 Expenditures

1.2.2.2.1 Actual expenditures in the subdivisions

The available ledger records showed the amounts spent in particular subdivisions; the principal expenditures were maintenance costs and water purchases.

1.2.2.2.2 Allocation of overhead expenditures among the subdivisions

The overhead expenditures consisted mainly of salaries, benefits and purchases of water and meters. The totals were allocated in proportion to each subdivisions's share of the municipality's total expenditure in identifiable localities.

SOURCE: M.D. of Sturgeon No 90. Ledger files, 1978 through 1980; trial balances, 1984; Financial Statements, 1978 through 1983.

1.2.3 SANITARY SEWER Revenues and Expenditures

1.2.3.1 Revenues

1.2.3.1.1 Actual revenues from the subdivisions

Revenues generated by the imposition of a monthly user charge are tabulated in the municipality's trial balances for 1984. However, the charge was only introduced in 1982.

1.2.3.1.2 Allocation of overhead revenues among the subdivisions

Records prior to 1981 are difficult to disaggregate and residual revenues could not be assigned. In 1981 through 1983, revenues from sewer applications, private repairs and pipe sales were distributed among subdivisions based on known circumstances. Cardiff Echoes was the only subdivision (although not the only locality) which received sewer service in 1981, therefore all the municipality's revenue from sewer applications in that year (the only residual revenue in 1981) was assumed to be generated in Cardiff Echoes. In 1982 and 1983, when there were also customers in Manor Estates Phase 2, the municipality's revenues were distributed among the subdivisions proportional to the subdivision's shares of the actual revenue from all subdivisions.

1.2.3.2 Expenditures

1.2.3.2.1 Actual expenditures in the subdivisions

Details of expenditures by subdivision are given in ledger cards and trial balances.

From 1983 through 1987, the municipality has to make an annual principal and interest payment of $19,240.79 on a bank loan obtained to reimburse the developer of Manor Estates Phase II for the oversizing of a sewage main. As the oversizing will benefit residents of Upper and Lower Manor Estates and Upper and Lower Viscount Estates, the annual expenditure on the loan is distributed among the latter subdivisions in proportion to share of total lots in the four developments.

1.2.3.2.2 Allocation of overhead expenditures among the subdivisions

Expenditures on salaries, services and supplies in 1980 through 1983 were distributed among the subdivisions in proportion to the subdivisions' shares of geographically assignable expenditure.

SOURCE: M.D. of Sturgeon No. 90. Ledger files, 1978 through 1980; trial balance, 1984; Financial Statements, 1978 through 1983.

1.2.4 AGRICULTURE SERVICE BOARD Revenues and Expenditures

1.2.4.1 Revenue

An Agriculture Service Board (A.S.B.) performs a variety of functions, nearly all of which are farm-related. For the purposes of the study, it is assumed that country residential subdivisions do not provide the rationale for the existence of the Board in the M.D. of Sturgeon. Consequently, none of the revenue which accrues to the Board is assumed to be related to the study's subdivisions. (The purpose of the Department of Agriculture's A.S.B. grants--a major source of funding for the A.S.B.--is "to assist rural municipalities in providing agricultural services and programs for the farming public"[1].). No A.S.B. revenue is assigned to the subdivisions or is included in the non-separable revenues distributed among the subdivisions in proportion to population.

1.2.4.2 Expenditure

A.S.B. expenditures in most years are composed mainly of purchases of supplies (e.g. chemicals, seed, fertilizer) for resale and services performed (e.g. mowing, spraying of weedkiller, pest control) on municipal property. In the study's country residential subdivisions, the principal and possibly only expense is that of mowing the reserve land. The cost of this work in each year has been estimated by deflating the actual costs in 1983 by the amount of change in the Consumer Price Index. No overhead A.S.B. expenditure has been allocated to the subdivisions.

SOURCE: M.D. of Sturgeon No. 90. Financial Statements, 1970 through 1983; Fieldman, personal communication, summer 1983.

[1]Alberta Municipal Affairs, Alberta Municipal Assistance Programs 1984.

1.2.5 STREET-LIGHTING Revenues and Expenditures

Street-lights are activated when 75 per cent of the lots in a subdivision are occupied. The M.D. plays no part in operating or maintaining the lights. These functions are performed by Trans Alta Utilities, who also supply the power. The latter company bills the M.D. monthly for all the services. The M.D. in turn recoups the charge through the general tax levy, not through a tax or levy imposed only on residents of the areas possessing street lights. Theoretical street-lighting revenue from the two subdivisions where lights are provided is buried within the subdivisions' tax revenue.

Expenditures have been estimated by dividing up the M.D.'s annual street-lighting expenditure (which is entered on the M.D.'s ledger records from 1977 to 1983) in proportion to the number of street lights (as of 1984). Since the number of residents in the subdivisions is less than the population of the municipality, street-lighting expenditure per capita in each subdivision exceeds the street-lighting revenue per capita. Street-lighting in subdivisions, consequently, is always a cost to the municipality.

SOURCE: M.D. of Sturgeon No. 90. Ledger files, 1977 through 1983; Treasurer, personal communication, summer 1984.

1.2.6 PROPERTY TAX revenues

The property taxes collected from each subdivision were calculated from the municipality's tax and assessment records.

1.2.7 DEVELOPER'S LEVY

The size of any levy imposed by the municipality as a condition of development approval is given in the Development Permit(s) for a subdivision, or in the development agreement.

1.3 NON-SEPARABLE Revenues and Expenditures

1.3.1 Revenues

1.3.1.1 MISCELLANEOUS revenues

The non-separable revenues of the municipality were calculated by summing the revenues from various sources identified in the municipal Financial Statements. A portion of the total in each year was then assigned to each subdivision, in proportion to population.

The sources are the same in each year but the nomenclature in the Financial Statements changed in 1974 and 1981. The sources included in the three sets of years are listed below:

1.3.1.1 1970-73

Licences and permits
Rents, concessions and franchises
Fines
Interest Earnings
Penalties and Costs
Service charges
Recreation and community services
Contributions, grants and subsidies excluding grants to Agriculture Service Board and grants-in-lieu
Homeowners Tax Discount Act
Miscellaneous excluding Agricultural Service Board revenues

SOURCE: M.D. of Sturgeon No. 90 Financial Statements, 1970 through 1973. Exhibit 10-Form 25 General Fund: Statement of General Revenue and Expenditure, p.6. Details of Contributions, Grants and Subsidies, p.15.

1.3.1.2 1974-80

Financial statement code

300 Services provided to other governments
400 Sales of goods and services excluding Sewage Services (412) and estimated sales by the Agriculture Service Board
500 Other revenue from own sources excluding 514: Mobile Unit Licenses
600 Unconditional transfers from other governments
700 Conditional transfers from federal or provincial governments and their agencies excluding transfers to Sewage Services and to Agriculture Service board
800 Conditional transfers from other local governments

SOURCE: M.D. of Sturgeon No. 90 Financial Statements, 1974 through 1980. Form 1-1: General Operating Fund - Statement of Revenue and Expenditure, P.3. Schedule R: Analysis of Transfers - Operating funds Revenue, pp.65-65.1.

1.3.1.3 1981-83

Financial Statement Code

100/200 Special Municipal Levies (a recreation levy in 1983 only)
300 Sales to Other Governments
400 Sales of Goods and Services
520 Professional and Other Licences and Permits
560 Rental Revenues
590 Other Revenues from Own Sources
840 Provincial Conditional Grants
990 Grants Non-Government and Other Sources

for the following functions:

12 General Administration
24 Disaster
26 Bylaws Enforcement
31 Common Services
32 Roads
61 Planning & Development
71 Recreation Board
72 Recreation Other

SOURCE: M.D. of Sturgeon No. 90 Financial Statements, FR19: Operating Functions Revenues by Type.

In addition:

510 Penalties and Costs on Taxes
550 Returns on Investments
740 Provincial Government and Agencies Unconditional Grants

SOURCE: M.D. of Sturgeon No. 90 Financial Statements, FS3: Combined Operating Revenues and Expenditures.

1.3.1.2 ROAD Revenues

1.3.1.2.1 Actual revenues from the subdivisions

There are no charges imposed on subdivisions specifically for public works; in the main, costs are met from property tax revenue. As a result, "actual" road revenues cannot be calculated.

1.3.1.2.2 Allocation of overhead revenues among the subdivisions

Prior to 1981, no revenue items related to public works were listed separately in municipal financial statements; such revenues are included in the non-separable revenues, which are allocated to the subdivisions on a population basis. Road revenue items for 1981 through 1983 are shown in the Financial Statements but are again allocated in proportion to population. The items so distributed were provincial conditional grants, sales to other governments, sales of goods and services and other revenues from own sources.

1.3.2 Expenditures

1.3.2.1 1970-73

General government (administration)
Protection to persons and property excluding Agriculture Service Board expenditures
Sanitation and waste removal
Social welfare
Recreation and Community Services
Debt charges
Utilities
Homeowners Tax Discount Act
Miscellaneous expenditures

SOURCE: M.D. of Sturgeon No. 90, Financial Statements, 1970 through 1973. Exhibit 10-Form 25: General Fund - Statement of General Revenue and Expenditure, p.7.

1.3.2.2 1974-80

Financial Statement Code

01	General Government Services
02	Protective services
04	Environmental health services excluding Sewage Collection & Disposal (0402)
05	Public health and welfare services
07	Recreation and cultural services
08.01	Debt charges

SOURCE: M.D. of Sturgeon No. 90 Financial Statements, 1974 through 1980 Form 1-2: General Operating Fund - Statement of Revenue and Expenditure, p.4.

1.3.2.3 1981-83

Financial Statement Code

100	Salaries, Wages and Benefits
200	Contracted and General Services
300	Purchases from Other Governments
500	Materials, Goods, Supplies and Utilities
700	Grants to Government
770	Grants to Individuals and Organizations
810	Bank Charges and Short-Term Interest
830	Debenture Debt Charges

for the following functions:

11	Council
12	General Administration
21	Police
23	Fire
26	Bylaws Enforcement
43	Garbage
61	Planning and Development
71	Recreation Board
72	Recreation Other

SOURCE: M.D. of Sturgeon No. 90, Financial Statements, FR19: Operating Functions Expenditures by Object.

Present Value of Annual Revenues and Expenditures for Twelve Subdivisions in the M.D. of Sturgeon

GROUP ONE (no water, no sewer)

Year	CLEARVIEW ACRES			LOWER VISCOUNT ESTATES			UPPER VISCOUNT ESTATES			GIBBONSLEA			BRAUN VILLAGE		
	Present Value of Revenue ($)	Present Value of Expenditure ($)	Net Present Value ($)	Present Value of Revenue ($)	Present Value of Expenditure ($)	Net Present Value ($)	Present Value of Revenue ($)	Present Value of Expenditure ($)	Net Present Value ($)	Present Value of Revenue ($)	Present Value of Expenditure ($)	Net Present Value ($)	Present Value of Revenue ($)	Present Value of Expenditure ($)	Net Present Value ($)
1970							413.00	0.00	413.00						
1971							3616.54	637.23	2979.31						
1972							5915.71	1206.08	4709.62						
1973							10551.17	3944.20	6606.97						
1974							14878.39	3655.40	11222.99						
1975				4215.00	844.00	3371.00	13161.36	3664.53	9496.84						
1976				14789.53	2882.26	11907.27	14393.68	2834.36	11559.31						
1977	1763.00	948.00	815.00	16206.73	3945.60	12261.13	14570.95	3766.63	10804.32	26802.00	0.00	26802.00	29050.00	0.00	29050.00
1978	3000.57	1414.09	1586.48	14627.65	11013.65	3614.00	13742.29	12606.60	1135.69	1456.97	560.04	896.93	0.00	0.00	0.00
1979	20248.26	5664.20	14584.06	37601.34	9100.80	28500.54	34809.80	8529.44	26280.36	17813.76	5702.36	12111.41	2916.81	1256.93	1659.88
1980	7538.00	4152.66	3385.34	16193.25	4905.36	11287.89	14217.81	4452.33	9765.49	9833.38	4196.87	5636.51	2003.10	2315.83	-312.74
1981	5763.23	2476.34	3286.89	12386.71	4199.04	8187.67	11329.33	4102.46	7226.88	8382.02	2699.79	5682.23	2050.68	1101.03	949.64
1982	8581.37	3725.54	4855.83	16761.65	6198.71	10562.94	15153.93	5787.60	9366.33	12272.82	4509.64	7763.18	2825.24	1383.81	1441.43
1983	7818.96	3757.73	4061.22	14268.43	6298.05	7970.37	13097.44	5878.65	7218.78	11119.30	4565.31	6553.99	2905.20	1369.16	1536.04
1984	7446.63	3578.79	3867.83	13588.98	5998.15	7590.83	12473.75	5598.72	6875.03	10589.81	4347.91	6241.89	2766.85	1303.96	1462.89
1985	7092.02	4357.32	2734.70	12941.88	10809.11	2132.77	11879.76	11584.56	295.20	10085.53	4909.44	5176.09	2635.10	2222.19	412.91
1986	6754.31	3246.07	3508.24	12325.60	5440.50	6885.11	11314.06	5078.20	6235.86	9605.27	3943.69	5661.58	2509.62	1182.73	1326.89
1987	6432.68	3091.50	3341.18	11738.67	5181.42	6557.24	10775.29	4836.38	5938.91	9147.87	3755.89	5391.98	2390.11	1126.41	1263.70
1988	6126.36	2944.28	3182.08	11179.68	4309.71	6869.97	10262.18	3994.36	6267.82	8712.26	3577.04	5135.22	2276.30	1072.77	1203.52
1989	5834.63	3584.78	2249.84	10647.32	4104.49	6542.83	9773.51	3804.16	5969.35	8297.39	4039.01	4258.38	2167.90	1828.20	339.70
1990	5556.79	2670.55	2886.24	10140.30	3909.04	6231.27	9308.10	3623.00	5685.10	7902.28	3244.48	4657.80	2064.67	973.04	1091.63
1991	5292.18	2543.38	2748.80	9657.43	3722.89	5934.54	8864.86	3450.48	5414.38	7525.98	3089.98	4436.00	1966.35	926.70	1039.65
1992	5040.17	2422.27	2617.90	9197.55	7167.66	2029.89	8442.72	7729.67	713.05	7167.60	2942.84	4224.76	1872.72	882.57	990.14
1993	4800.16	2949.21	1850.95	8759.58	3376.77	5382.80	8040.69	3129.69	4911.00	6826.28	3322.90	3503.38	1783.54	1504.06	279.47
1994	4571.58	2197.07	2374.51	8342.45	3215.97	5126.48	7657.80	2980.66	4677.14	6501.22	2669.24	3831.98	1698.61	800.52	898.09
1995	4353.89	2092.45	2261.44	7945.19	3062.83	4882.36	7293.14	2838.72	4454.42	6191.64	2542.14	3649.50	1617.72	762.40	855.32
1996	4146.56	1992.81	2153.75	7566.85	2916.98	4649.87				5896.80	2421.08	3475.72	1540.69	726.10	814.59
1997	3949.10	2426.32	1522.78	7206.52	2778.08	4428.44				5616.00	2733.76	2882.24	1467.32	1237.40	229.92
1998	3761.05	1807.53	1953.52	6863.36	2645.79	4217.57				5348.57	2195.99	3152.58	1397.45	658.59	738.86
1999	3581.95	1721.46	1860.49	6536.53	5093.92	1442.60				5093.88	2091.42	3002.46	1330.90	627.23	703.68
2000	3411.38	1639.49	1771.90	6225.27	2399.81	3825.46				4851.31	1991.83	2859.48	1267.53	597.36	670.17
2001	3248.94	1996.14	1252.80							4620.30	2249.07	2371.22	1207.17	1018.01	189.16
2002	3094.23	1487.06	1607.16							4400.28	1806.65	2593.64	1149.68	541.82	607.86
2003															
2004															
2005															
2006															
Sum	149208.01	70887.07	78320.94	307913.47	125520.62	182392.85	295937.29	119714.12	176223.18	222060.52	80108.37	141952.15	76861.27	27418.84	49442.43
	B-C Ratio	2.10		B-C Ratio	2.45		B-C Ratio	2.47		B-C Ratio	2.77		B-C Ratio	2.80	

GROUP TWO (water, no sewer)

Year	NAMAO RIDGE			HEWITT ESTATES			UPPER & LOWER MANOR ESTATES			CASA VISTA		
	Present Value of Revenue ($)	Present Value of Expenditure ($)	Net Present Value ($)	Present Value of Revenue ($)	Present Value of Expenditure ($)	Net Present Value ($)	Present Value of Revenue ($)	Present Value of Expenditure ($)	Net Present Value ($)	Present Value of Revenue ($)	Present Value of Expenditure ($)	Net Present Value ($)
1970												
1971												
1972												
1973												
1974												
1975	7987.00	3539.00	4448.00	57167.00	0.00	57167.00						
1976	24160.87	8441.29	15719.58	0.00	0.00	0.00	101421.00	0.00	101421.00			
1977	45901.48	14140.54	31760.93	0.00	0.00	0.00	6984.77	2765.85	4218.92			
1978	57270.15	27871.25	29398.91	4726.58	5290.05	-563.47	11996.39	6596.90	5399.50	40926.00	0.00	40926.00
1979	137822.28	33698.02	104124.27	41430.12	14037.06	27393.06	62631.12	17937.41	44693.72	1319.53	0.00	1319.53
1980	57393.83	25307.92	32085.91	27859.59	50764.84	-22905.25	57716.76	68722.37	-11005.62	13068.11	8335.33	4732.78
1981	48692.10	22282.54	26409.56	29604.12	10718.27	18885.86	58781.77	20802.20	37979.57	27702.96	14380.06	13322.91
1982	60066.29	33242.62	26823.66	38431.23	14075.42	24355.81	77921.26	28371.86	49549.40	14917.94	-2343.02	17260.95
1983	51728.70	39660.98	12067.72	33634.55	23458.75	10175.81	87540.12	40044.78	47495.34	18448.79	7100.97	11347.82
1984	49265.43	23017.67	26247.76	32032.91	13171.34	18861.57	83371.54	38137.88	45233.66	17570.28	6762.83	10807.45
1985	46919.46	21921.59	24997.87	30507.53	12544.13	17963.40	79401.47	36321.79	43079.67	16733.60	7552.12	9181.48
1986	44685.20	20877.70	23807.49	29054.79	11946.79	17108.00	75620.44	34592.18	41028.26	15936.76	6134.08	9802.67
1987	42557.33	19883.53	22673.80	27671.23	19299.57	8371.66	72019.47	68122.50	3896.97	15177.86	5841.99	9335.88
1988	40530.79	18936.69	21594.10	26353.55	10836.09	15517.46	68589.97	27586.73	41003.24	14455.11	5563.80	8891.31
1989	38600.76	18034.95	20565.81	25098.62	10320.09	14778.53	65323.78	26273.07	39050.71	13766.77	6213.15	7553.62
1990	36762.62	45582.39	-8819.76	23903.45	9828.66	14074.79	62213.13	25021.98	37191.15	13111.21	5046.53	8064.68
1991	35012.02	16358.23	18653.79	22765.19	9360.62	13404.56	59250.60	23830.45	35420.14	12486.87	4806.22	7680.65
1992	33344.78	15579.26	17765.52	21681.13	8914.88	12766.25	56429.14	22695.67	33733.47	11892.26	4577.35	7314.90
1993	31756.94	14837.40	16919.54	20648.70	8490.36	12158.33	53742.04	21614.92	32127.11	11325.96	5111.57	6214.38
1994	30244.70	14130.85	16113.85	19665.43	13715.84	5949.58	51182.89	45585.68	5597.22	10786.62	4151.79	6634.84
1995	28804.48	13457.95	15346.52	18728.98	7701.01	11027.97	48745.61	19605.37	29140.24	10272.98	3954.09	6318.89
1996	27432.84	12817.10	14615.74	17837.12	7334.30	10502.83	46424.39	18671.78	27752.61	9783.79	3765.80	6017.99
1997	26126.51	32394.55	-6268.04	16987.74	6985.04	10002.69	44213.71	17782.65	26431.06	9317.89	4205.30	5112.59
1998	24882.39	11625.49	13256.90	16178.80	6652.42	9526.37	42108.29	16935.86	25172.43	8874.18	3415.69	5458.50
1999	23697.52	11071.89	12625.62	15408.38	6335.64	9072.74	40103.14	16129.39	23973.75	8451.60	3253.04	5198.57
2000	22569.06	10544.66	12024.40	14674.64	6033.94	8640.70	38193.46	15361.32	22832.14	8049.15	3098.13	4951.02
2001							36374.73	32396.89	3977.84	7665.85	3459.71	4206.14
2002										7300.81	2810.10	4490.72
2003										6953.16	2676.28	4276.87
2004												
2005												
2006												
Sum	1074215.5	529256.08	544959.46	612051.38	287815.13	324236.25	1488301.0	691907.49	796393.51	339342.89	117196.62	222146.27
	B-C Ratio	2.03		B-C Ratio	2.13		B-C Ratio	2.15		B-C Ratio	2.90	

GROUP THREE (water, sewer)

Year	CARDIFF ECOHES			MANOR ESTATES PHASE TWO		
	Present Value of Revenue ($)	Present Value of Expenditure ($)	Net Present Value ($)	Present Value of Revenue ($)	Present Value of Expenditure ($)	Net Present Value ($)
1970						
1971						
1972						
1973						
1974						
1975						
1976	91500.00	0.00	91500.00			
1977	0.00	0.00	0.00			
1978	683.24	5851.90	-5168.66			
1979	81009.55	23876.60	57132.95			
1980	72092.10	29671.56	42420.54			
1981	144232.48	41528.99	102703.49	34000.00	0.00	34000.00
1982	82215.06	42870.63	39344.43	17.19	0.00	17.19
1983	76881.85	51487.23	25394.62	11501.16	1813.28	9687.88
1984	73220.81	49035.46	24185.35	10953.49	1726.94	9226.55
1985	69734.10	46700.44	23033.67	10431.90	2346.67	8085.23
1986	66413.43	44476.61	21936.83	9935.14	2234.92	7700.22
1987	63250.89	42358.67	20892.22	9462.04	2128.50	7333.54
1988	60238.94	121030.76	-60791.81	9011.46	2027.14	6984.32
1989	57370.42	38420.56	18949.86	8582.35	1930.61	6651.74
1990	54638.50	36591.01	18047.48	8173.66	1838.68	6334.99
1991	52036.66	34848.58	17188.08	7784.44	38418.29	-30633.85
1992	49558.73	33189.13	16369.60	7413.75	1667.73	5746.02
1993	47198.79	31608.69	15590.09	7060.72	1588.32	5472.40
1994	44951.23	30103.52	14847.71	6724.49	1512.68	5211.81
1995	42810.69	28670.02	14140.67	6404.28	1440.65	4963.63
1996	40772.09	27304.78	13467.31	6099.31	1372.05	4727.26
1997	38830.56	26004.55	12826.01	5808.87	1306.71	4502.16
1998	36981.48	74302.38	-37320.90	5532.26	1244.49	4287.77
1999	35220.46	23586.89	11633.57	5268.82	1185.23	4083.59
2000	33543.30	22463.71	11079.59	5017.92	1128.79	3889.13
2001	31946.00	21394.01	10551.99	4778.97	23585.50	-18806.53
2002				4551.40	1023.84	3527.56
2003				4334.67	975.09	3359.58
2004				4128.26	928.66	3199.60
2005				3931.67	884.43	3047.24
2006				3744.45	842.32	2902.13
Sum	1447331.3	927376.69	519954.68	200652.67	95151.51	105501.15
	B-C Ratio	1.56		B-C Ratio	2.11	

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